

Curriculum Vita

David R. Bowling

8/15/07

Assistant Professor
Department of Biology, University of Utah
257 S. 1400 E., Salt Lake City, UT 84112-0840
(801) 581-2130
bowling@biology.utah.edu

Research Interests

Ecosystem ecology, biosphere-atmosphere interactions, carbon and water cycling

Academic Positions

2003 – present Assistant Professor, Dept. of Biology, University of Utah
2006 – present Adjunct Assistant Professor, Dept. of Meteorology, University of Utah
2001 – 2002 Research Assistant Professor, Biology, University of Utah
1999 – 2001 Postdoctoral Scientist, Biology, U. of Utah, with J. Ehleringer

Education

1999	Ph.D. Biology	University of Colorado, Boulder, with R. Monson
1994	M.S. Electrical Engineering	University of Colorado, Boulder, with D. Etter
1991	B.S. Electrical Engineering	New Mexico State University

Peer-Reviewed Publications

(graduate students underlined)

Number of times cited (published papers listed in Web of Science as of Aug. 2007)

- senior-authored papers: 304 times cited (avg 27.6/paper)
- co-authored papers: 232 times cited (avg 15.5/paper)

in review:

Zobitz JM, Moore D, Sacks WJ, Monson RK, Bowling DR, Schimel DS, Integration of process-based soil respiration models with whole-ecosystem CO₂ measurements, submitted 6/07 to *Ecosystems*.

Schaeffer SM, Anderson DE, Burns SP, Monson RK, Sun J, Bowling DR, Canopy structure and atmospheric flows in relation to the $\delta^{13}\text{C}$ of respired CO₂ in a subalpine coniferous forest, submitted 6/07 to *Agricultural and Forest Meteorology*.

Zobitz JM, Burns SP, Reichstein M, Bowling DR, Partitioning net ecosystem carbon exchange and the carbon isotopic disequilibrium between whole-ecosystem photosynthesis and respiration in a subalpine forest, submitted 5/07 to *Global Change Biology*.

Schwinning S, Bowling D, Ehleringer J, Belnap J, Sensitivity of the Colorado Plateau to change: climate, ecosystems, and society, submitted 5/07 to *BioScience*.

in press:

Zobitz JM, Burns SP, Ogee J, Reichstein M, Bowling DR, Partitioning net ecosystem exchange of CO₂ in a high-elevation subalpine forest: comparison of a

Bayesian/isotope approach to environmental regression methods, submitted 8/06 to *Journal of Geophysical Research*.

published:

32. Fuentes JD, Wang D, Bowling D, Potosnak M, Monson RK, Delany AC, Stockwell WR, Goliff WS (2007) Biogenic hydrocarbon chemistry within and above a mixed deciduous forest, *Journal of Atmospheric Chemistry*, DOI 10.1007/s10874-006-9048-4.
31. Zobitz JM, Keener JP, Schnyder H, Bowling DR (2006) Sensitivity analysis and quantification of uncertainty for isotopic mixing relationships in carbon cycle research, *Agricultural and Forest Meteorology*, 136:56-75.
30. Wahl EH, and 12 others (2006) Applications of cavity ring-down spectroscopy to high precision isotope ratio measurement of $^{13}\text{C}/^{12}\text{C}$ in carbon dioxide, *Isotopes in Environmental and Health Studies*, 42:21-35, doi:10.1080/10256010500502934.
29. Pataki DE, Bowling DR, Ehleringer JR, Zobitz JM (2006) High resolution atmospheric monitoring of urban carbon dioxide sources, *Geophys. Res. Lett.*, 33, L03813, doi:10.1029/2005GL024822.
28. Bowling DR, Burns SP, Conway T, Monson R, White JWC (2005) Extensive observations of CO_2 carbon isotope content in and above a high-elevation subalpine forest, *Global Biogeochemical Cycles*, 19, GB3023, doi:10.1029/2004GB002394.
27. Roden JS, Bowling DR, McDowell NG, Bond B, Ehleringer JR (2005) Carbon and oxygen isotope ratios of tree ring cellulose along a precipitation transect in Oregon, USA, *Journal of Geophysical Research*, 110, G02003, doi:10.1029/2005JG000033.
26. Baldocchi DD, and Bowling DR (2005) Theoretical examination of Keeling-plot relationships for carbon dioxide in a temperate broadleaved forest with a biophysical model, CANISOTOPE, in: Flanagan LB, Ehleringer JR, Pataki DE, Eds. *Stable Isotopes and Biosphere-Atmosphere Interactions: Processes and Biological Controls*, Elsevier, Amsterdam, pp 109-124.
25. McDowell NG, Bowling DR, Schauer A, Irvine J, Bond BJ, Law BE, Ehleringer JR (2004) Associations between carbon isotope ratios of ecosystem respiration, water availability and canopy conductance, *Global Change Biology*, 10, 1767–1784, doi: 10.1111/j.1365-2486.2004.00837.x
24. McDowell NG, Bowling DR, Bond BJ, Irvine J, Law BE, Anthoni P, Ehleringer JR (2004) Response of the carbon isotopic content of ecosystem, leaf and soil respiration to meteorological and physiological driving factors in a *Pinus ponderosa* ecosystem, *Global Biogeochemical Cycles*, 18, GB1013, doi:10.1029/2003GB002049.
22. Bowling DR, McDowell NG, Welker JM, Bond BJ, Law BE, Ehleringer JR (2003) Oxygen isotope content of CO_2 in nocturnal ecosystem respiration: 1: Observations in forests along a precipitation transect in Oregon, USA, *Global Biogeochemical Cycles*, 17(4), 1120, doi:10.1029/2003GB002081.
21. Bowling DR, McDowell NG, Welker JM, Bond BJ, Law BE, Ehleringer JR (2003) Oxygen isotope content of CO_2 in nocturnal ecosystem respiration: 2: Short-term dynamics of foliar and soil component fluxes in an old-growth ponderosa pine forest, *Global Biogeochemical Cycles*, 17(4), 1124, doi:10.1029/2003GB002082.
20. Pataki DE, Bowling DR, Ehleringer JR (2003) The seasonal cycle of carbon dioxide and its isotopic composition in an urban atmosphere: anthropogenic and biogenic effects, *Journal of Geophysical Research*, 108(D23), 4735, doi:10.1029/2003JD003865.

19. Bowling DR, Sargent SD, Tanner BD, and Ehleringer JR (2003) Tunable diode laser absorption spectroscopy for stable isotope studies of ecosystem-atmosphere CO₂ exchange, *Agricultural and Forest Meteorology*, 118, 1-19.
18. Schauer AJ, Lai C-T, Bowling DR, Ehleringer JR (2003) An automated sampler for collection of atmospheric trace gas samples for stable isotope analyses, *Agricultural and Forest Meteorology*, 118, 113-124.
17. Bowling DR, Pataki DE, and Ehleringer JR (2003), Critical evaluation of micrometeorological methods for measuring ecosystem-atmosphere isotopic exchange of CO₂, *Agricultural and Forest Meteorology*, 116, 159-179.
16. Pataki DE, Ehleringer JR, Flanagan LB, Yakir D, Bowling DR, Still CJ, Buchmann N, Kaplan JO, and Berry J (2003) The application and interpretation of Keeling plots in terrestrial carbon cycle research, *Global Biogeochemical Cycles*. 17(1), 1022, doi:10.1029/2001GB001850.
15. Baldocchi DD, and Bowling DR (2003) Modelling the discrimination of ¹³CO₂ above and within a temperate broad-leaved forest canopy on hourly to seasonal time scales, *Plant, Cell, and Environment*, 26:231-244.
14. Ehleringer JR, Bowling DR, Flanagan LB, Fessenden J, Helliker B, Martinelli LA, Ometto JP (2002) Stable isotopes and carbon cycle processes in forests and grasslands, *Plant Biology*, 4:181-189.
13. Bowling D, McDowell N, Bond B, Law B, and Ehleringer J (2002) ¹³C content of ecosystem respiration is linked to precipitation and vapor pressure deficit, *Oecologia*, 131:113-124.
12. Bowling DR, Cook CS, and Ehleringer JR (2001) Technique to measure CO₂ mixing ratio in small flasks with a bellows/IRGA system, *Agricultural and Forest Meteorology*, 109, 61-65.
11. Bowling DR, Tans PP, and Monson RK (2001) Partitioning net ecosystem carbon exchange with isotopic fluxes of CO₂, *Global Change Biology*, 7:127-145.
10. Bowling DR, Baldocchi DD, and Monson RK (1999) Dynamics of isotopic exchange of carbon dioxide in a Tennessee deciduous forest, *Global Biogeochemical Cycles*, 13:903-922.
9. Bowling DR, Delany AC, Turnipseed AA, Baldocchi DD, and Monson RK (1999) Modification of the relaxed eddy accumulation technique to maximize measured scalar mixing ratio differences in updrafts and downdrafts, *Journal of Geophysical Research*, 104:9121-9133.
8. Baldocchi D, Fuentes J, Bowling D, Turnipseed A, and Monson R (1999) Scaling isoprene fluxes from leaves to canopies: test cases over a boreal aspen and a mixed species temperate forest, *Journal of Applied Meteorology*, 38:885-898.
7. Katul G, Hsieh C-I, Bowling D, Clark K, Shurpali N, Turnipseed A, Albertson J, Tu K, Hollinger D, Evans B, Offerle B, Anderson D, Ellsworth D, Vogel C, and Oren R (1999) Spatial variability of turbulent fluxes in the roughness sublayer of an even-aged pine forest, *Boundary-Layer Meteorology*, 93:1-28.
6. Singsaas E, Laporte M, Shi J, Monson R, Bowling D, Johnson K, Lerdau M, Jasentuliytana A, and Sharkey T. (1999) Kinetics of leaf temperature fluctuation affects isoprene emission from red oak (*Quercus rubra* L.) leaves, *Tree Physiology*, 19:917-924.
5. Bowling DR, Turnipseed AA, Delany AC, Baldocchi DD, Greenberg JP, and Monson RK (1998) The use of relaxed eddy accumulation to measure biosphere-atmosphere exchange of isoprene and other trace gases, *Oecologia*, 116:306-315.
4. Demmig-Adams B, Adams III WW, Barker DH, Logan BA, Bowling DR, and Verhoeven AS (1996) Using chlorophyll fluorescence to assess the fraction of

absorbed light allocated to thermal dissipation of excess excitation, *Physiologia Plantarum* 98:253-264.

technical reports:

23. American Institute of Biological Sciences. (2004) Ecological Aspects of Biogeochemical Cycles: Report from a NEON Science Workshop. Washington, DC: AIBS.
3. Durand S and Bowling D (1990) *Data Acquisition for Photovoltaic Power Plants*, EPRI Publication GS-7082, Electric Power Research Institute.
2. Durand S, Bowling D, and Risser V (1990) Lessons Learned From Testing Utility Connected PV Systems, *Proc. 21st IEEE PV Specialists Conference*, 909-913.
1. Rosenthal A, Lane C, and Bowling D (1990) *Photovoltaic System Performance Assessment for 1988*, EPRI Publication GS-6696, Electric Power Research Institute.

Grant Support

Present:

Long-term assessment of isotopic exchange of carbon dioxide in a subalpine forest (Niwoot Ridge AmeriFlux site), U. S. Department of Energy, DE-FG02-04ER63904, **\$649.8k**, PI: Bowling, 9/04-9/07.

Isotope Ratio Mass Spectrometers for Environmental Research, NSF Major Research Instrumentation, **\$405k**, PIs: Ehleringer, Cerling, Bowling, 7/07-6/09.

Past:

Development of a novel real-time method to measure the stable isotope content of carbon dioxide respired from soil, University of Utah Funding Incentive Seed Grant Program, **\$27k**, PI: Bowling, 7/06-6/07.

Field-deployable gas analyzer for MMV applications (Phase I), U. S. Department of Energy, SBIR program, PI: Anthony O'Keefe, Los Gatos Research, Bowling subcontract **\$14.8k**, 2/07-3/07.

Technical proposal for the development of a Fourier-transform infrared gas analyzer to measure carbon isotopes of CO₂, U.S. Department of Energy, SBIR program, PI: Larry Jacobsen, Campbell Scientific, Inc., Bowling subcontract **\$15.2k**, 8/05-7/06. (this grant was awarded but the company did not make enough progress to merit testing the instrument, so we never saw the money at Utah)

System upgrade for Biology's shared tunable diode laser absorption spectrometer, Research Instrumentation Fund Award, University of Utah, **\$7.1k**, PI: Bowling, 7/05.

Instrumentation purchase for a shared tunable diode laser absorption spectrometer, Research Instrumentation Fund Award, University of Utah, **\$77.6k**, PI: Bowling, 6/03.

Ecosystem carbon cycling in a desert grassland, University Research Committee Faculty Research and Creative Grant, University of Utah, **\$5.4k**, PI: Bowling, 5/03-5/04.

Ultra-sensitive portable isotope ratio analyzer, US Department of Energy, SBIR DE-FG03-01ER83250-A002, PI: Dmitri Permogorov, Picarro, Inc., Bowling subcontract **\$122k**, 5/02-5/04.

Pending:

A Regional Atmospheric Continuous CO₂ Observing Network in the Rocky Mountains (Rocky RACCOON): Operation and Synthesis with Remote Sensing Products to Produce Regional Carbon Flux Estimates, NASA Carbon Cycle Science, PI Britt Stephens, National Center for Atmospheric Research, Bowling subcontract **\$168.3k**, 1/08-12/10.

Field-deployable gas analyzer for MMV applications (Phase II), U. S. Department of Energy, SBIR program, PI: Anthony O'Keefe, Los Gatos Research, Bowling subcontract **\$63.6k**, 1/08-1/09.

Environmental controls on the isotopic content of plant, soil, and ecosystem respiration, US Department of Energy Terrestrial Carbon Processes Program, **\$721k**, PI: Bowling, 9/06-8/09 (still in review, very delayed by the agency)

Graduate student fellowships (I contributed as Ph.D. advisor):

Comparison and assessment of methods to partition net ecosystem exchange of CO₂ in heterogeneous environments, US Department of Energy Global Change Education Program, Graduate Research Environmental Fellowship, **\$54k**, (2005-2008), (awarded to John Zobitz)

Teaching

Ecosystem Ecology (new course Fall 2004, Fall 2006, Biology 5490): This lecture course for 50-70 upper division or graduate students examines the biological, physical, and chemical factors that control storage and cycling of the major elements (carbon, nitrogen, and phosphorus) within terrestrial ecosystems.

Biophysical Ecology (new course Fall 2005, Fall 2007, Biology/Meteorology/Geology 5495): This lecture and laboratory course for 25 upper division or graduate students examine the physical environment in which plants, animals, and soil organisms live, how the physical environment affects their physiological function, and how organisms in turn affect their physical environment.

Water and Ecology of Western Ecosystems (new course Fall 2003, Biology 7406): This graduate core seminar examines the importance of water to animals, plants, insects, and microbes in ecosystems of the western U.S.

Biological Responses to Climate Change (new course Spring 2005, Biology 7406): This graduate core seminar examines observed responses of biological systems to climate change, such as increased growing season length, altered migration patterns, changes in species abundance, etc.

Stable Isotope Ecology (existing course, team-taught Summers 2003-2007, Biology 7473/7475): This summer 2-week course attracts top-notch graduate students, postdocs, and faculty from around the world. The course focuses on environmental science applications of stable isotope theory, methods, instrumentation, experimental design, lab and fieldwork.

University Service

University Committees

College of Science Representative to International Requirement Committee, since 8/05

Department of Biology Committees

2002-2003 Graduate Admission

2003-2004 Graduate Admission, Communication, BioURP Steering, Red Butte Canyon
2004-2005 Graduate Admission, BioURP Steering, Red Butte Canyon
2005-2006 Graduate Admission, Curriculum and Teaching, Red Butte Canyon, Riser Award
2006-2007 Graduate Admission, Curriculum and Teaching, Red Butte Canyon
2007-2008 pending

Science Overnight Orientation, Faculty Volunteer, 6/05 and 6/06

Professional Service

Associate Editor, Journal of Geophysical Research – Biogeosciences, since 12/04.

AmeriFlux Steering Committee member, which oversees a national flux tower CO₂ monitoring network, since 10/04.

Manuscript reviews:

Agricultural and Forest Meteorology, Analytical Chemistry, Applied Geochemistry, Applied Spectroscopy, Atmospheric Environment, Australian Journal of Plant Physiology, Chemical Geology, Ecological Applications, European Journal of Soil Biology, Geochimica et Cosmochimica Acta, Global Biogeochemical Cycles, Global Change Biology, Isotopes in Environmental and Health Studies, Journal of Applied Meteorology, Oecologia, Plant, Cell, and Environment, Tellus, Tree Physiology

Grant proposal review panels:

- NSF June 2007

Grant proposal reviews:

- NSF Directorate for Biological Sciences, Division of Environmental Biology
 - Ecosystem Science cluster
 - Instrumentation and Instrumentation Development
 - Major Research Instrumentation
- NSF Directorate for Geosciences, Division of Atmospheric Sciences
- USDOE National Institute for Global Environmental Change
 - Northeast Regional Center
 - Southeast Regional Center
 - Great Plains Regional Center
- USDOE National Institute for Climatic Change Research
 - Northeast Regional Center
 - Southeast Regional Center
- USDOE Small Business Innovation Research
- Kearney Foundation for Soil Science (U. California system)
- NOAA Climate and Global Change Program
- Natural Environment Research Council (United Kingdom)
- Israel Science Foundation (Israel)
- Swiss National Science Foundation (Switzerland)

External dissertation reviews:

- Australian National University, Research School of Biological Sciences (Australia)

Active in developmental meetings for National Ecological Observatory Network (NEON, <http://www.neoninc.org/>)

- Site evaluation visit to Onaqui-Benmore area in Utah for Great Basin Domain 15 Core Site, 4/07.
- Rocky Mountain Ecological Observatory Network (ROMEOnet) Regional Meetings, Ft. Collins, CO, 11/04, Boulder, CO, 4/04.
- Invited participant, NEON Workshop, Boulder, CO, 7/04 – co-authored an associated publication (in list above)

Active in developmental meetings for Consortium of Universities for the Advancement of Hydrologic Science, Inc. (CUAHSI, <http://www.cuahsi.org/>)

- collaboration on a vision paper regarding Watersheds and Urbanization
- development of the Great Salt Lake Basin as a Long-Term Hydrologic Observatory

Interaction with local media

- global change public discussion panel for KCPW radio, 6/16/06
- KCPW radio article, 3/16/06
- Newspaper article, Salt Lake Tribune, 8/7/06
- Newspaper article, Daily Utah Chronicle, 4/11/06
- Op-ed article, Daily Utah Chronicle, 9/17/04

Students and Employees Supervised

Graduate Students

- Primary PhD Advisor for:
Seth Arens: beginning Fall 2007.
Greg Maurer: beginning Fall 2007.
Andrew Moyes: Expected to finish his Ph.D. sometime in 2008.
John Zobitz: Awarded Ph.D. at end of summer 2007, accepted a tenure-track faculty position at Augsburg College.
- Served on Supervisory Committee for:
 - Biology: Susan Bush, Tomas Domingues, Sylvia Englund, Erin Hanlon, Anthony Macharia, Jessica Pearce, Christy Turnbull, Adam West
 - Mathematics: Molly Kelton
 - Geology and Geophysics: Mike Davis

Postdoctoral Scientists: Sean Schaeffer

Undergraduates: Susan Bush, Sarah Gaines, Zach James, Tina Jensen, Stephanie Plummer, Sarah Reed

Technicians: Suzanne Bethers, David Galvez, Shashi Kalaskar, Shannon Kincaid, Claire Lunch, Andy Schauer

Invited Lectures and Seminars

international:

- Bowling D, Stable Isotopes of CO₂ and Forest Carbon Cycling, Wissenschaftszentrum Weißenstephan, Technische Universität München, Freising, Germany, 1/07.
- Bowling D, Zobitz J, Burns S, Monson R, and Turnipseed A, Partitioning assimilation and respiration in a subalpine forest using isofluxes, International Symposium: "Partitioning of fluxes between the biosphere and atmosphere across spatial scales", ESF Scientific Programme, Stable Isotopes in Biospheric-Atmospheric Exchange (SIBAE), Interlaken, Switzerland, 4/04.
- Bowling D, Burns S, Monson R, Turnipseed A, Photosynthetic and respiratory fluxes and their isotopic content in a Colorado subalpine forest, International Symposium: "Stable isotopic signals of the terrestrial biosphere: Linking ecosystem C fluxes to isotopic signals of plant components", ESF Scientific Programme, Stable Isotopes in Biospheric-Atmospheric Exchange (SIBAE), Orvieto, Italy, 11/03.
- Bowling D, Partitioning NEE using ecosystem fluxes of ¹³CO₂, Fluxnet Synthesis Workshop, Orvieto, Italy, 06/02.
- Bowling D, Lai C-T, McDowell N, Short-term environmental effects on δ¹³C of ecosystem respiration, Stable Isotopes and Biosphere-Atmosphere Interactions International Workshop, Banff, Alberta, 5/02.

within U.S.:

- Bowling D, Stable isotopes of CO₂ and forest carbon cycling, School of Biological Sciences, Washington State University, 2/07.
- Bowling D, Stable isotopes of CO₂ and forest carbon cycling, Department of Ecology and Evolutionary Biology, University of Arizona, 4/06.
- Bowling D, Stable isotopes and carbon exchange between terrestrial ecosystems and the atmosphere, American Society of Agronomy Annual Meeting, Salt Lake City, 11/05.
- Bowling D, Stable isotopes and carbon exchange between terrestrial ecosystems and the atmosphere, Department of Geography, University of Utah, 4/05.
- Bowling D, Partitioning net ecosystem carbon exchange with fluxes of ¹³CO₂, Department of Environmental Sciences, University of Virginia, 2/05.
- Bowling D, The oxygen isotope composition of nocturnal ecosystem respiration, International Symposium: "Oxygen isotopes as a tracer linking global O₂, CO₂, and H₂O cycles", Biosphere-Atmosphere Stable Isotope Network, Marshall, California, 9/04.
- Bowling D, Stable isotopes and carbon exchange between terrestrial ecosystem and the atmosphere, Bowdoin College, Department of Biology. 2/04.
- Bowling D, Yakir D, Interpreting ecosystem respiration fluxes using stable isotopes, in symposium "Respiratory control of the global C cycle in a changing environment", Ecological Society of America Annual Meeting, Savannah, GA, 8/03.
- Bowling D, Stable isotopes of atmospheric CO₂ and ecosystem-scale biological processes, Columbia University's Biosphere2 Center, 10/01.
- Bowling D, Partitioning Biosphere-Atmosphere Exchange of CO₂ into Photosynthesis and Respiration using Tower Measurements, University of Utah, Dept. of Geology and Geophysics, 9/01.
- Bowling D, The Math Behind Eddy Covariance: Studying Biological Processes with Atmospheric Measurements, University of Utah, Mathematical Biology Seminar Series, 3/01.

Bowling D and Monson R, Forest-Atmosphere Fluxes of $^{13}\text{CO}_2$, American Geophysical Union Fall Meeting, San Francisco, CA, 12/99.

Bowling D, Flux measurement using relaxed eddy accumulation, AmeriFlux Network Annual Meeting, St. Louis, MO, 10/97.

Other Lectures and Seminars

(graduate students underlined)

Moyes AB, Bowling DR, Causes of seasonal and temporal variability in soil respiration along a Rocky Mountain riparian-meadow ecotone, Ecological Society of America annual meeting, San Jose, CA, 8/07.

Schaeffer SM, Monson RK, Burns SP, Bowling DR, Temporal and spatial effects on the isotopic composition of ecosystem-respired CO_2 in a high-elevation subalpine forest, Ecological Society of America annual meeting, San Jose, CA, 8/07.

Bowling DR, Schaeffer SS, Miller JM, Stephens B, CO_2 and $\delta^{13}\text{C}$ of CO_2 at three spatial scales over the Rocky Mountains, American Geophysical Union Fall Meeting, San Francisco, 12/06.

Moyes AB, Bowling DR, Seasonality of temperature, moisture, and substrate controls on soil carbon dioxide in a Rocky Mountain meadow, American Geophysical Union Fall Meeting, San Francisco, 12/06.

Schaeffer SM, Anderson DE, Burns SP, Monson RK, Sun J, Yi C, Bowling DR, Environmental controls on the stable isotopic composition of forest respired carbon dioxide across a vertical canopy profile in a subalpine coniferous forest, American Geophysical Union Fall Meeting, San Francisco, 12/06.

Zobitz JM, Ogee J, Monson RK, Bowling DR, High-resolution stable-isotope partitioning of net ecosystem exchange into respiration and photosynthesis, American Geophysical Union Fall Meeting, San Francisco, 12/05.

Pataki DE, Bowling DR, Ehleringer JR, Zobitz JM (presenter), High resolution atmospheric monitoring of urban carbon dioxide sources, US. Dept. of Energy Global Change Education Program Summer Orientation Workshop, Portland, Oregon, 6/06.

Roden JS, Bowling DR, Ehleringer JR, Stable oxygen and carbon isotope ratios of tree ring cellulose along a precipitation transect in Oregon, 2005 Annual Meeting of the American Society of Plant Biologists, 7/05.

Crosson E, Rella C, Richman B, Kachanov A, Wahl E, Tan S, Pham H, Koulikov S, Kharlamov B, Fidric B, Sanders S, Bowling D, and Paldus B, Applications of cavity ring-down spectroscopy to high precision isotope ratio: measurements of $^{12}\text{C}/^{13}\text{C}$ in carbon dioxide, SIRIS 2004, International Workshop on Stable Isotope Ratio Infrared Spectrometry: New Developments and Applications, Vienna, Austria, 9/04.

McDowell NG, Bowling D, Schauer A, Irvine J, Bond BJ, Law B, Ehleringer JR, Seasonal variation in the carbon isotope ratio of ecosystem respiration in two coniferous forests, American Geophysical Union Fall Meeting, San Francisco, CA, 12/03.

Baldocchi D, Bowling D, Interpreting carbon isotope ($^{13}\text{CO}_2$) fluxes and profiles over and under a temperate broadleaved forest with a biophysical model, CANOAK, Stable Isotopes and Biosphere-Atmosphere Interactions International Workshop, Banff, Alberta, 5/02.

Bowling DR, McDowell NG, Anthoni PM, Law BE, Bond BJ, and Ehleringer J, Isotopic (^{13}C) response of ponderosa pine ecosystem respiration to atmospheric stress events, American Geophysical Union Fall Meeting, San Francisco, CA, 12/01.

Baldocchi DD, and Bowling DR, Modeling carbon isotope fluxes and concentration profiles over a temperate deciduous forest across a spectrum of time scales with

- a biophysical model, CANOAK, American Geophysical Union Fall Meeting, San Francisco, CA, 12/01.
- McDowell NG, Bowling DR, Lunch CK, Welker J, Anthoni P, Law B, Bond BJ, and Ehleringer JR, Oxygen-18 content of ecosystem respiration across a climatic gradient in Oregon, American Geophysical Union Fall Meeting, San Francisco, CA, 12/01.
- McDowell N, Bowling D, Bond B, and Ehleringer J, Seasonal variation of $\delta^{18}\text{O}$ of ecosystem respiration across a precipitation gradient in Oregon, USA, IUFRO Canopy Processes Workshop, 7/01.
- Bowling D, McDowell N, Bond B, Anthoni P, Irvine J, Law B, and Ehleringer J, Seasonal and interannual variation in the carbon isotopic composition of ecosystem respiration along an Oregon precipitation gradient, American Geophysical Union Fall Meeting, San Francisco, CA, 12/00.

Poster Presentations

(graduate students and junior researchers underlined)

- Ehleringer JR, Bramble D, Hultine K, Bowling D, Dearing MD, Entrada Field Station: a new opportunity for desert ecology and riparian ecology research in southeastern Utah, , Ecological Society of America annual meeting, San Jose, CA, 8/07.
- Schaeffer S, Miller J, Stephens B, Bowling D, Carbon dioxide and $\delta^{13}\text{C}$ of CO_2 at multiple spatial scales over the Rocky Mountains, US North American Carbon Program Investigators Meeting, Colorado Springs, CO, 1/07.
- Moyes AB, Bowling DR, Carbon dioxide, temperature, and moisture under a Rocky Mountain meadow, AmeriFlux Network annual meeting, Boulder, CO, 10/06.
- Zobitz J, Bowling D, Adler F, Keener J, Dobson D, Estimating respiratory and photosynthetic fluxes in a heterogeneous conifer forest, IGERT Project Meeting, Washington DC, 5/05.
- Zobitz JM, Keener JP, Bowling DR, Sensitivity analysis and quantification of uncertainty for isotopic mixing relationships in carbon cycle research, American Geophysical Union Fall Meeting, San Francisco, CA, 12/04.
- Zobitz JM, Keener JP, Bowling DR, Analysis of Linear Regression Techniques to Determine $\delta^{18}\text{O}_\text{R}$ and $\delta^{13}\text{C}_\text{R}$: Implications and Applications, International Symposium: "Oxygen isotopes as a tracer linking global O_2 , CO_2 , and H_2O cycles", Biosphere-Atmosphere Stable Isotope Network, Marshall, California, 9/04.
- Pataki DE, Bush SE, Bowling DR, Ehleringer JR, Ecosystem respiration in an urban atmosphere: an isotopic approach, Carbon Respiration from Terrestrial Ecosystems: Reducing Uncertainties in the Role Played by Respiration in the Global Carbon Cycle (workshop), Laguna Beach, CA, 01/04.
- Zobitz JM, Bowling DR, Process based belowground carbon dioxide modeling in a desert ecosystem, American Geophysical Union Fall Meeting, San Francisco, CA, 12/03.
- Reed SE, Bond BJ, Bowling DR, McDowell NG, Ehleringer JR, Stable isotopic variation across a precipitation gradient in Oregon, DOE Global Change Education SURE Program, 8/03.
- Lunch CK, Bowling DR, Difficulties of measuring eddy covariance fluxes of carbon dioxide at arid sites, Ecological Society of America Annual Meeting, Savanna GA, 8/03.
- Bethers S, Bowling DR, Evapotranspiration of a semi-arid Utah grassland during the summer monsoon, Ecological Society of America Annual Meeting, Savanna GA, 8/03.

- McDowell NG, Bowling D, Lunch CK, Welker J, Irvine J, Law BE, Bond BJ, Ehleringer JR, Relationships between precipitation, vapor pressure deficit, and $\delta^{18}\text{O}$ of ecosystem respiration across a steep climatic transect, Stable Isotopes and Biosphere-Atmosphere Interactions International Workshop, Banff, Alberta, 5/02.
- McDowell N, Bowling D, Ecosystem respired $\delta^{18}\text{O}$ and $\delta^{13}\text{C}$: calculation via slopes vs. intercepts, Stable Isotopes and Biosphere-Atmosphere Interactions International Workshop, Banff, Alberta, 5/02.
- Wever L, Flanagan LB, and Bowling DR, Seasonal and interannual variation in oxygen isotope discrimination in a temperate grassland ecosystem, American Geophysical Union Fall Meeting, San Francisco, CA, 12/01.
- Pataki DE, Ehleringer JR, Flanagan LB, Yakir D, Bowling DR, Still C, Buchmann N, and Berry JA, The carbon isotope composition of ecosystem respiration in North and South America, American Geophysical Union Fall Meeting, San Francisco, CA, 12/01.
- Bowling D, McDowell N, Bond B, Law B, and Ehleringer J, ^{13}C content of ecosystem respiration is linked to precipitation and vapor pressure deficit, International Union of Forestry Research Organizations (IUFRO) "Linking the Complexity of Forest Canopies to Ecosystem and Landscape Function" Workshop, 7/01.
- Flanagan LB, Carlson PJ, Wever LA, and Bowling DR, Interannual variation in precipitation and its consequences for ecosystem carbon dioxide exchange and carbon isotope discrimination in a northern grassland, American Geophysical Union Fall Meeting, San Francisco, CA, 12/00.
- 1999 ESA Best Student Poster in Physiological Ecology:*
- Bowling D, Baldocchi D, and Monson R, Partitioning net ecosystem exchange in a Tennessee deciduous forest using stable isotopes of carbon dioxide, Ecological Society of America, Spokane, WA, 8/99.
- Bowling D, Delany A, Turnipseed A, Baldocchi D, and Monson R, Modifying the REA technique to collect CO_2 for stable isotope analysis: hyperbolic relaxed eddy accumulation, FluxNet Conference, Polson, MT, 6/98.
- Bowling D, Turnipseed A, Delany A, Baldocchi D, Greenberg J, and Monson R, Relaxed eddy accumulation of isoprene above a mixed deciduous forest, Ecological Society of America, Albuquerque, NM, 8/97.
- Bowling D, Carbon cycling in a Colorado subalpine forest, EPA Star Graduate Conference, Raleigh-Durham, NC, 6/97.